

## Claims

### What is claimed is:

1. A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the

frequency that drives a piezoelectric element of a piezoelectric pump;

a voltage-boosting means for converting a low-voltage power supply to a high

5 voltage; and

an amplification means driven by high voltage generated by said voltage-

boosting means for amplifying the signal supplied as output from said sine

wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave.

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2. The piezoelectric pump drive circuit according to claim 1, wherein

said amplification means is composed of: a D-class amplifier that is driven at

high voltage generated by said voltage-boosting means for subjecting the signal

supplied as output from said sine wave oscillation means to pulse-width

5 modulation to realize amplification; and a low-pass filter for demodulating the

output signal of said D-class amplifier.

3. The piezoelectric pump drive circuit according to claim 1 or claim

2, further comprising a first control means for implementing variable frequency

control at the time of activating said sine wave oscillation means.

4. The piezoelectric pump drive circuit according to any one of

claims 1 to 3, further comprising: a temperature sensing means for sensing

temperature; and a second control means for adjusting the signal amplitude of

said sine wave oscillation means according to the sensed temperature of said

5 temperature sensing means.

5. The cooling system comprising;
- a piezoelectric pump drive circuit according to any one of claims 1 to 4;
  - a heat sink that contacts a heat-generating body;
  - a radiator for radiating heat to the outside;
- 5 coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and
- a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

**Amended Claims****What is claimed is:**

1. (Amended) A piezoelectric pump drive circuit comprising:  
a sine wave oscillation means for generating a sine wave signal of the  
frequency that drives a piezoelectric element of a piezoelectric pump;  
a voltage-boosting means for converting a low-voltage power supply to a high  
5 voltage; and  
an amplification means driven by high voltage generated by said voltage-  
boosting means for amplifying the signal supplied as output from said sine  
wave oscillation means and for driving said piezoelectric element by a high-  
voltage sine wave;  
10 wherein said amplification means is composed of: a D-class amplifier driven by  
a high voltage generated by said voltage-boosting means for subjecting the  
signal supplied as output from said sine wave oscillation means to pulse-width  
modulation to realize amplification; and a low-pass filter for demodulating the  
output signal of said D-class amplifier.  
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2. (Amended) A piezoelectric pump drive circuit comprising:  
a sine wave oscillation means for generating a sine wave signal of the  
frequency that drives a piezoelectric element of a piezoelectric pump;  
a voltage-boosting means for converting a low-voltage power supply to a high  
5 voltage;  
an amplification means driven by high voltage generated by said voltage-  
boosting means for amplifying the signal supplied as output from said sine  
wave oscillation means and for driving said piezoelectric element by a high-  
voltage sine wave; and  
10 control means for implementing variable frequency control over three or more

different frequencies at the time of activation of said sine wave oscillation means.

3. (Amended) A piezoelectric pump drive circuit comprising:  
 a sine wave oscillation means for generating a sine wave signal of the  
 frequency that drives a piezoelectric element of a piezoelectric pump;  
 a voltage-boosting means for converting a low-voltage power supply to a high  
 5 voltage;  
 an amplification means driven by high voltage generated by said voltage-  
 boosting means for amplifying the signal supplied as output from said sine  
 wave oscillation means and for driving said piezoelectric element by a high-  
 voltage sine wave; and  
 10 control means for implementing variable control of the frequency at the time of  
 activation of said sine wave oscillation means;  
 wherein said amplification means is composed of: a D-class amplifier driven by  
 a high voltage generated by said voltage-boosting means for subjecting the  
 signal supplied as output from said sine wave oscillation means to pulse-width  
 15 modulation to realize amplification; and a low-pass filter for demodulating the  
 output signal of said D-class amplifier.

4. (Amended) A piezoelectric pump drive circuit comprising:  
 a sine wave oscillation means for generating a sine wave signal of the  
 frequency that drives a piezoelectric element of a piezoelectric pump;  
 a voltage-boosting means for converting a low-voltage power supply to a high  
 5 voltage;  
 an amplification means driven by high voltage generated by said voltage-  
 boosting means for amplifying the signal supplied as output from said sine

wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

- 10 a temperature sensing means for sensing temperature; and  
a control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means.

5. (Amended) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;  
a voltage-boosting means for converting a low-voltage power supply to a high  
5 voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

- 10 a temperature sensing means for sensing temperature; and  
a control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;

wherein said amplification means is composed of: a D-class amplifier driven by  
15 a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier.

6. (Added) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;  
 a voltage-boosting means for converting a low-voltage power supply to a high  
 5 voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

- 10 a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;  
 a temperature sensing means for sensing temperature; and  
 a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said  
 15 temperature sensing means.

7. (Added) A piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;  
 a voltage-boosting means for converting a low-voltage power supply to a high  
 5 voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;

- 10 a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;  
 a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;  
15 wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the  
20 output signal of said D-class amplifier.

8. (Added) A cooling system comprising:  
a piezoelectric pump drive circuit comprising:  
a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;  
5 a voltage-boosting means for converting a low-voltage power supply to a high voltage; and  
an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-  
10 voltage sine wave;  
wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the  
15 output signal of said D-class amplifier;  
a heat sink that contacts a heat-generating body;  
a radiator for radiating heat to the outside;  
coolant circulation passages connected such that coolant circulates between

said heat sink and said radiator; and

20 a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

9. (Added) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

5 a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-

10 voltage sine wave; and

control means for implementing variable frequency control over three or more different frequencies at the time of activation of said sine wave oscillation means;

a heat sink that contacts a heat-generating body;

15 a radiator for radiating heat to the outside;

coolant circulation passages connected such that coolant circulates between said heat sink and said radiator;

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

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10. (Added) A cooling system comprising:

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the



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frequency that drives a piezoelectric element of a piezoelectric pump;

5 a voltage-boosting means for converting a low-voltage power supply to a high voltage;

an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-

10 voltage sine wave; and

a control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;

wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the  
15 signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;

a heat sink that contacts a heat-generating body;

a radiator for radiating heat to the outside;

20 coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and

a piezoelectric pump that is driven by said piezoelectric pump drive circuit for circulating coolant in said coolant circulation passages.

11. (Added) A cooling system comprising: -

a piezoelectric pump drive circuit comprising:

a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;

5 a voltage-boosting means for converting a low-voltage power supply to a high voltage;

- an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-voltage sine wave;
- 10 a temperature sensing means for sensing temperature; and
- a control means for adjusting the signal amplitude of said sine wave oscillation means in accordance with the sensed temperature of said temperature sensing means;
- 15 a heat sink that contacts a heat-generating body;
- a radiator for radiating heat to the outside;
- coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and
- a piezoelectric pump that is driven by said piezoelectric pump drive circuit for
- 20 circulating coolant in said coolant circulation passages.

12. (Added) A cooling system comprising:

- a piezoelectric pump drive circuit comprising:
- a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;
- 5 a voltage-boosting means for converting a low-voltage power supply to a high voltage;
- an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-
- 10 voltage sine wave;
- a temperature sensing means for sensing temperature; and
- a control means for adjusting the signal amplitude of said sine wave oscillation

means in accordance with the sensed temperature of said temperature sensing means;

- 15 wherein said amplification means is composed of: a D-class amplifier driven by a high voltage generated by said voltage-boosting means for subjecting the signal supplied as output from said sine wave oscillation means to pulse-width modulation to realize amplification; and a low-pass filter for demodulating the output signal of said D-class amplifier;
- 20 a heat sink that contacts a heat-generating body;  
a radiator for radiating heat to the outside;  
coolant circulation passages connected such that coolant circulates between said heat sink and said radiator; and  
a piezoelectric pump that is driven by said piezoelectric pump drive circuit for  
25 circulating coolant in said coolant circulation passages.

13. (Added) A cooling system comprising:

- a piezoelectric pump drive circuit comprising:  
a sine wave oscillation means for generating a sine wave signal of the frequency that drives a piezoelectric element of a piezoelectric pump;
- 5 a voltage-boosting means for converting a low-voltage power supply to a high voltage;
- an amplification means driven by high voltage generated by said voltage-boosting means for amplifying the signal supplied as output from said sine wave oscillation means and for driving said piezoelectric element by a high-
- 10 voltage sine wave;
- a first control means for implementing variable frequency control at the time of activation of said sine wave oscillation means;
- a temperature sensing means for sensing temperature; and

a second control means for adjusting the signal amplitude of said sine wave  
 oscillation means in accordance with the sensed temperature of said  
 15 temperature sensing means;  
 a heat sink that contacts a heat-generating body;  
 a radiator for radiating heat to the outside;  
 coolant circulation passages connected such that coolant circulates between  
 20 said heat sink and said radiator; and  
 a piezoelectric pump that is driven by said piezoelectric pump drive circuit for  
 circulating coolant in said coolant circulation passages.

14. (Added) A cooling system comprising:

a piezoelectric pump drive circuit comprising:  
 a sine wave oscillation means for generating a sine wave signal of the  
 frequency that drives a piezoelectric element of a piezoelectric pump;  
 5 a voltage-boosting means for converting a low-voltage power supply to a high  
 voltage;  
 an amplification means driven by high voltage generated by said voltage-  
 boosting means for amplifying the signal supplied as output from said sine  
 wave oscillation means and for driving said piezoelectric element by a high-  
 10 voltage sine wave;  
 a first control means for implementing variable frequency control at the time of  
 activation of said sine wave oscillation means;  
 a temperature sensing means for sensing temperature; and  
 a second control means for adjusting the signal amplitude of said sine wave  
 15 oscillation means in accordance with the sensed temperature of said  
 temperature sensing means;  
 wherein said amplification means is composed of: a D-class amplifier driven by

a high voltage generated by said voltage-boosting means for subjecting the  
signal supplied as output from said sine wave oscillation means to pulse-width  
20 modulation to realize amplification; and a low-pass filter for demodulating the  
output signal of said D-class amplifier;  
a heat sink that contacts a heat-generating body;  
a radiator for radiating heat to the outside;  
coolant circulation passages connected such that coolant circulates between  
25 said heat sink and said radiator; and  
a piezoelectric pump that is driven by said piezoelectric pump drive circuit for  
circulating coolant in said coolant circulation passages.

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